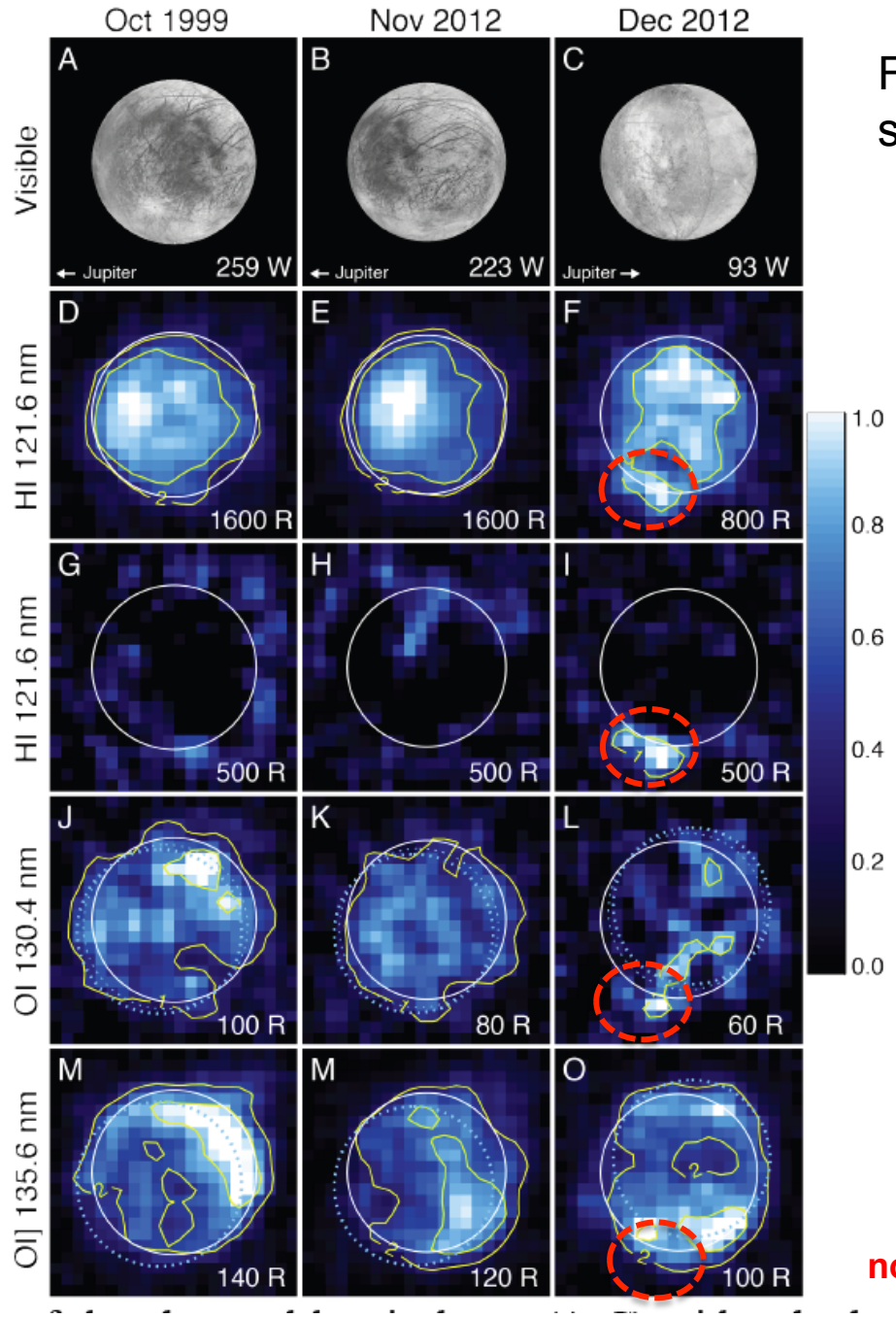


Hydrogen: reflected + emission

Hydrogen: emission only, reflected light subtracted

Oxygen: reflected + emission

Oxygen: emission only, no reflected light at this wavelength

Figure 1 from Roth et al. 2014: sum of all images from 3 dates

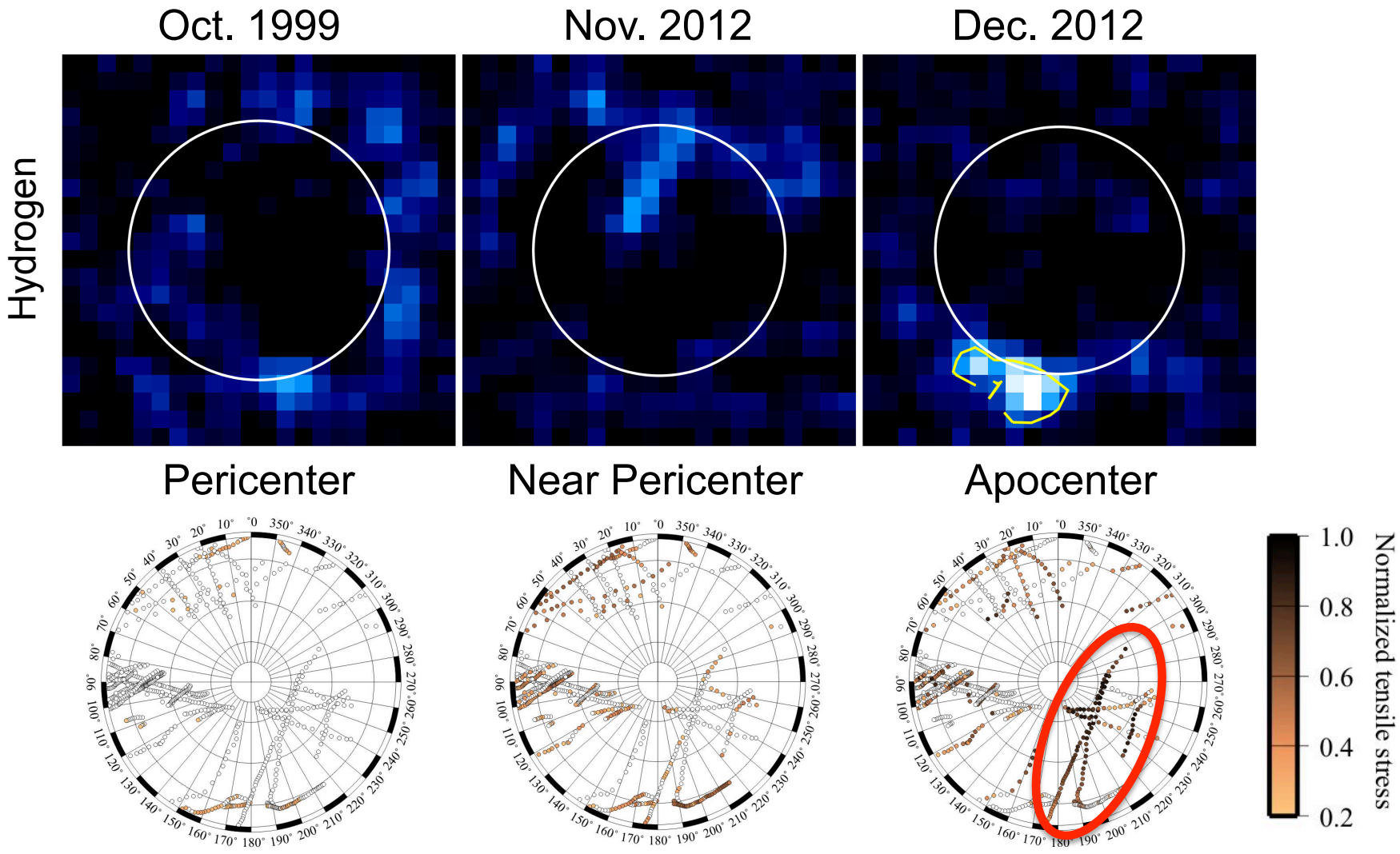
Jovian plasma electrons dissociate and excite neutrals in Europa's atmosphere. At some wavelengths, sunlight is also reflected from the satellite surface.

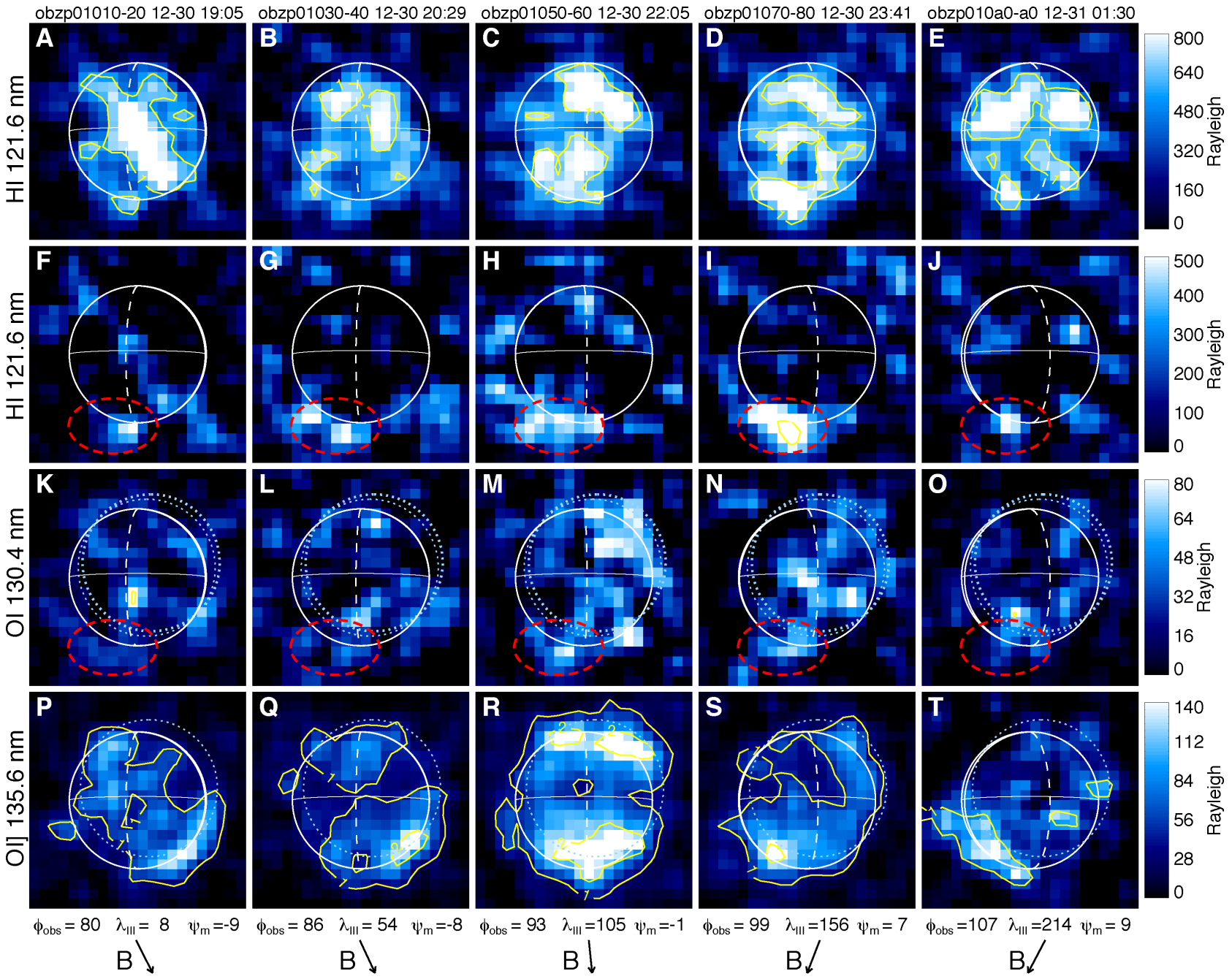
The only viable process to produce H and O emissions with the observed brightness ratios is

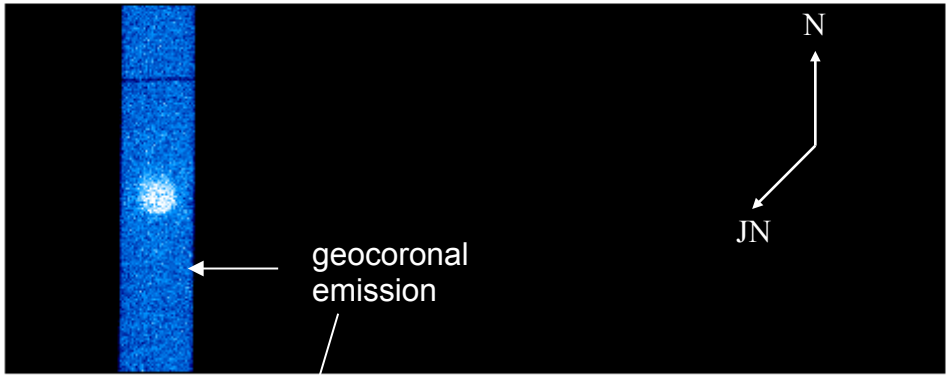
$$e + H_2O \rightarrow H^* + O^*$$
$$\rightarrow H + O + \gamma_{1216,1304}$$

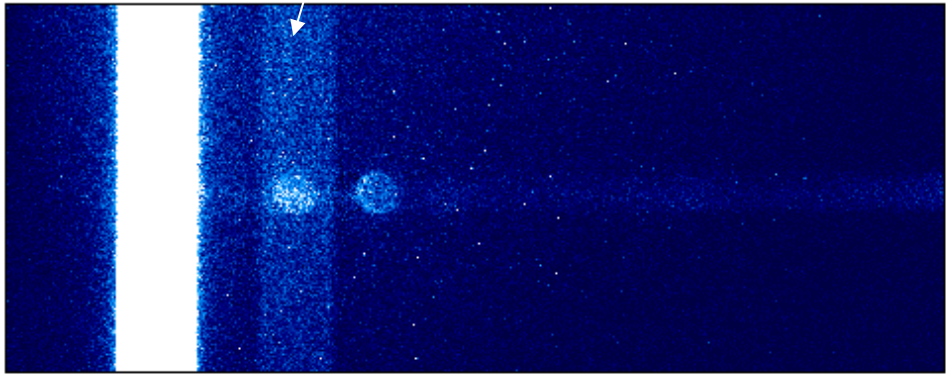
no emission at 1356A

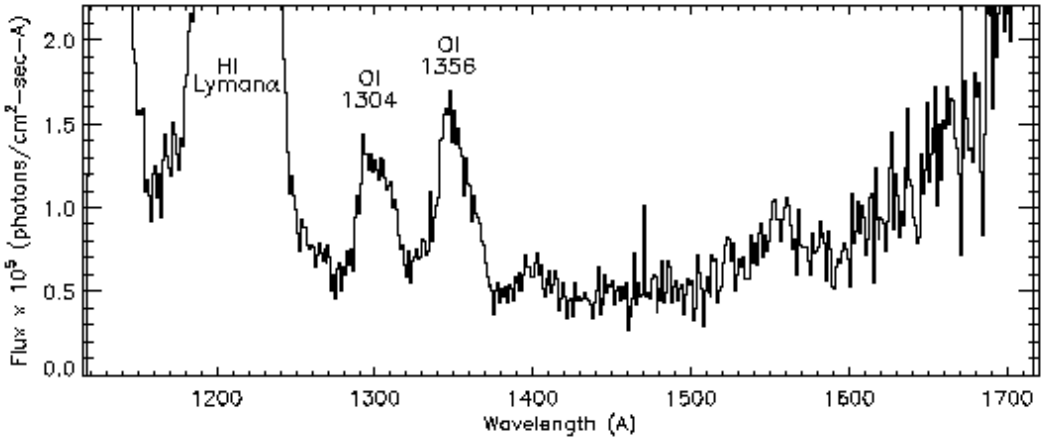
Evidence for plume variability




obzp01010-20 12-30 19:05
obzp01030-40 12-30 20:29
obzp01050-60 12-30 22:05
obzp01070-80 12-30 23:41
obzp010a0-a0 12-31 01:30
HI 121.6 nm
HI 121.6 nm
OI 130.4 nm
OIJ 135.6 nm
A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
S
T
800
640
480
320
160
0
Rayleigh
500
400
300
200
100
0
Rayleigh
80
64
48
32
16
0
Rayleigh
140
112
84
56
28
0
Rayleigh
ϕobs = 80 λIII = 8 ψm =-9
ϕobs = 86 λIII = 54 ψm =-8
ϕobs = 93 λIII =105 ψm =-1
ϕobs = 99 λIII =156 ψm = 7
ϕobs =107 λIII =214 ψm = 9
B
B
B
B
B







STIS data format

grating + slit larger than the satellite = imaging spectroscopy

produces a monochromatic image of the satellite at wavelengths where there is enough emission + reflected light

Reflected light component is readily determined by fitting the longer wavelength continuum, where all the light is reflected from the surface.